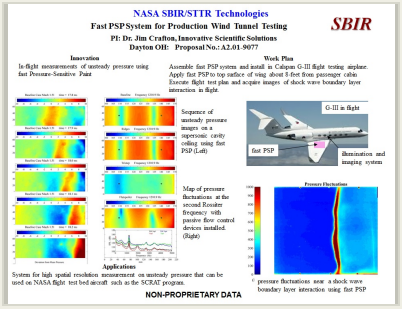
Small Business Innovation Research/Small Business Tech Transfer

In-Flight Measurements of Unsteady Pressure using Fast PSP, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Flight research is a critical element for the validation of ground test measurements and the maturation of new technology. Experimental measurement systems that offer fast response, high accuracy and reliability, and require minimal modification of the flight vehicle are needed to conduct flight research more effectively. There have recently been significant advances in the use of one such technology, fast responding Pressure-Sensitive Paint. Fast PSP offers a means of acquiring unsteady pressure data at millions of locations on a model surface, a capability that has recently been demonstrated in large transonic wind tunnels such as AEDC 16T, the Ames 11-foot, and Langley 14X22. Demonstration of this measurement technique in flight testing is the goal of this proposal. Use of the fast PSP system in flight involves, applying a polymer paint to the region of interest, illuminating the paint with 400-nm lighting, and then imaging the paint with a fast framing camera. Each pixel on the camera acts as a pressure tap, and therefore, continuous distributions of the unsteady pressure on the painted surface are acquired. While optical access to the region of interest is required, there are key fluid structures on the top surface of a wing, such as shock boundary layer interactions and wing buffet, that are easily viewed from the passenger compartment of a plane. ISSI, in collaboration with Calspan, propose a demonstrating unsteady pressure measurements on a shock wave boundary layer interaction on the top surface of the Calspan Gulfstream G-III wing in-flight using fast PSP. By combining ISSI experience with fast PSP and Calspans existing flight test capability, a successful program is anticipated. During Phase II, we anticipate packaging the fast PSP system for deployment to the NASA flight test bed aircraft, specifically the SCRAT program, and repackaging the system for use in regions with limited optical access, such as the landing bay, to study cavity acoustics.



In-Flight Measurements of Unsteady Pressure using Fast PSP, Phase I Briefing Chart Image

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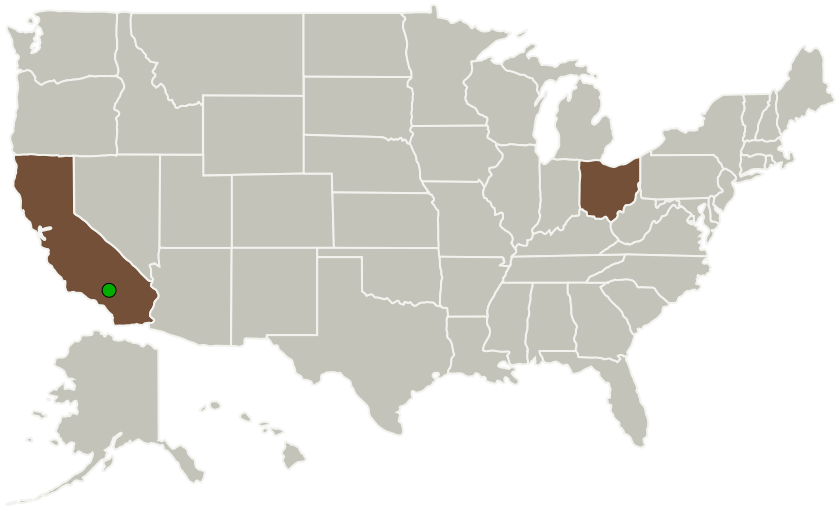
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Innovative Scientific Solutions, Inc.	Lead Organization	Industry	Dayton, Ohio
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Ohio

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Scientific Solutions, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

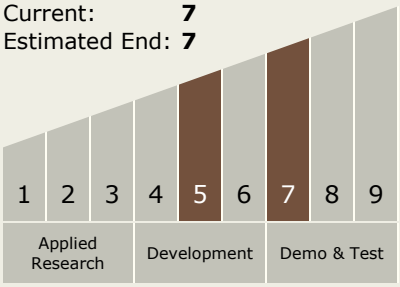
Carlos Torrez

Principal Investigator:

Jim Crafton

Technology Maturity (TRL)

Start: **5**
Current: **7**
Estimated End: **7**



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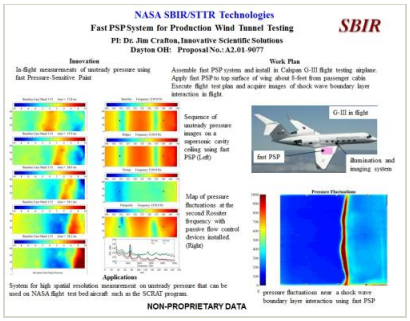
Images



Briefing Chart Image
In-Flight Measurements of Unsteady Pressure using Fast PSP, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/129058)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System